When used as directed by a doctor, powerful prescription pain medications called opioids (pronounced OH-pee-oyds) have helped millions of people cope with serious pain. But when used incorrectly, they can be addictive and deadly.

Some pain can be treated by over-the-counter medications such as Advil® and Tylenol®. But for pain from surgery, cancer, or serious injuries, doctors often prescribe the most powerful medications available—opioids. Opioid medications, such as Vicodin® and OxyContin®, are part of a class of drugs that resemble opioid chemicals our bodies make. In nature, opioids are found in the poppy plant, which is the source of some opioid medications as well as illegal opioids such as heroin.

Opioid medications are made to specific standards and regulated by the government for safety. But opioid medications can be powerfully addictive and can cause an overdose if not taken correctly. How is it that a medication that is so effective at relieving pain and helpful in healing can be so harmful when misused? The answer comes from how opioids work in the body.

Opioid Drugs: Master Impersonators
Opioid drugs, including medications and illegal drugs, are chemically very similar to endorphins, one of the body’s natural opioids. When opioid drugs are taken, they use opioid receptors that are normally accessed by endorphins to tap into the body’s systems. However, opioid drugs are more powerful than the opioids the body makes, so they trigger much stronger reactions.

Opioids and Pain
Endorphins naturally block pain by binding to opioid receptors in the spinal cord and other parts of the nervous system. Opioid drugs mimic endorphins but cause a much stronger pain-blocking signal. This is why opioid medications are prescribed for serious pain.

Opioids and Addiction
Opioid receptors are also found in the part of the brain that releases dopamine. Dopamine causes us to feel pleasure and to remember which behaviors produced this feeling. For example, endorphins released during physical activity can prompt a surge of dopamine, known as a “runner’s high.” Opioid drugs, however, cause a larger flood of dopamine to be released. The brain remembers the “high” and over time, with repeated abuse, develops an altered dopamine response. The brain begins to crave the extra intensity only an opioid drug can deliver, which can lead to addiction.
OPIOIDS IN THE BODY

Opioid receptors are located in the brain, brain stem, spinal cord, intestines, and other organs. When endorphins, our body’s naturally made opioids, are released or when opioid drugs, including medications, are taken, they bind to opioid receptors in the brain and body to regulate functions including pain, pleasure, breathing, and digestion.

BRAIN: There are opioid receptors throughout the brain, including in the cerebral cortex, cerebellum, nucleus accumbens, ventral tegmental area, substantia nigra, and hypothalamus of the brain. These areas are involved in pain perception, emotion, and reward (pleasure). The activation of the reward center is the primary reason opioids can lead to addiction.

BRAIN STEM: When opioids bind to receptors in the brain stem, breathing slows down, which creates a feeling of relaxation. This reaction to opioids is the reason an overdose can cause a person’s breathing to stop.

SPINAL CORD: The opioid receptors in the spinal cord reduce pain signals from an injury, sickness, or surgery. This interference in pain perception is the intended function of prescription opioids.

Opioids and Overdose

Opioid receptors in the brain and brain stem also regulate breathing. In proper doses, opioids slow breathing and create a feeling of relaxation. But if a person takes too much, he or she can stop breathing entirely. Taking opioids with other drugs that also slow breathing, such as alcohol, increases the risk that a person will stop breathing.

In 2014, there were 28,647 drug-poisoning deaths involving prescription opioids or heroin. This number has tripled since 2002. As a result of many more people now abusing prescription opioids, overdose deaths from opioids have also spiked. In fact, they now outnumber deaths from heroin and cocaine combined.

Rise in Heroin Use and Overdoses

Approximately 80 percent of current heroin users got started by first misusing prescription opioids. However, only about 4 percent of people who misuse prescription opioids will start using heroin. Still, the United States is experiencing a spike in heroin use among men and women, of all income levels and most age groups. As heroin use goes up, so does the death rate from heroin overdose, which has quadrupled in the past 10 years.

In Case of Opioid Overdose: Call 911. Naloxone is an emergency medication that can prevent opioid overdose death if given in time.

Dependence vs. Addiction

Patients taking opioid medications for a long period of time often develop a tolerance, requiring more opioids to achieve the same effect. Long-term use may also lead the body to produce fewer endorphins and opioid receptors. These changes signal a physical dependence, which causes people to go through withdrawal, feeling sick or depressed without opioid drugs. Physical dependence can—but doesn’t always—lead to addiction, a disease that involves additional changes to brain circuitry. Someone who is addicted takes drugs compulsively, even when he or she experiences negative consequences. While dependence involves a person’s physical body, addiction takes over his or her entire life.

How to Stay Safe

Most people who take prescription opioids do not become addicted or overdose. The risk for serious problems goes up when opioids are misused. If you are ever prescribed an opioid, take these precautions:

- You and your parents should talk about the risks with your doctor and ask about any alternative treatments.
- Take your medications exactly as prescribed. If you are still in pain while following the directions, you should go back to the doctor—not take more of your medicine.
- If you have a history of a substance use disorder or mental illness, tell your doctor, as these increase your risk for addiction.
- If you start taking prescription opioids that have not been prescribed to you, or more than your doctor prescribed, or for their pleasurable effects, tell your doctor, a parent, or another trusted adult. These are signs that you may have a substance use disorder and need professional help. The sooner you get help, the better your chances are for recovery.
- Do not give your prescription drugs to anyone else. This is dangerous and illegal.
- If you have leftover pills, ask a pharmacist or look online for programs that take back unused medications.*
- Opioids should never be combined with alcohol. Combining them increases the risk of overdose and death.